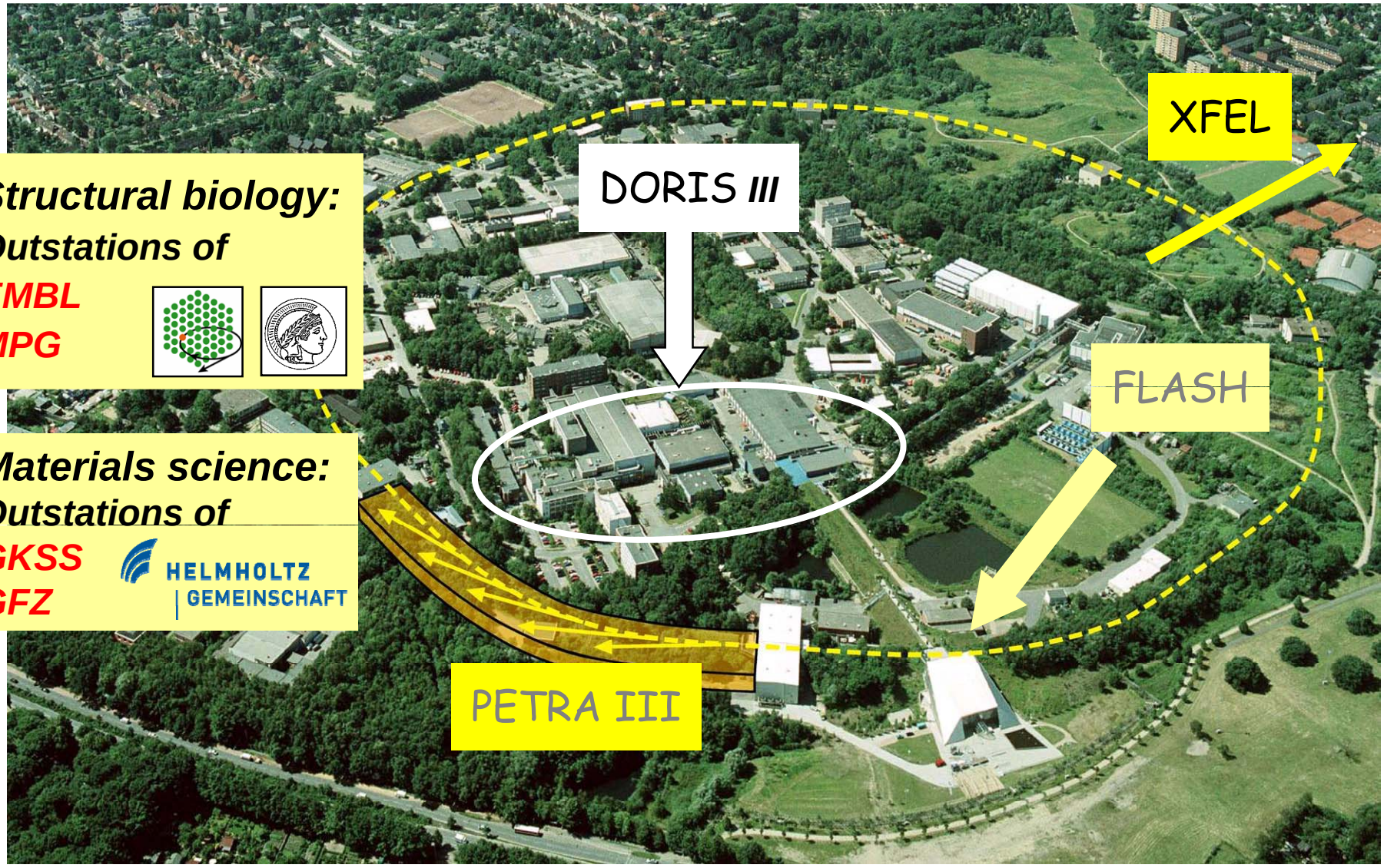
DESY – Status and Outlook

Plenary ECFA

17. Juli 2008

Albrecht Wagner

Research with Photons at DESY

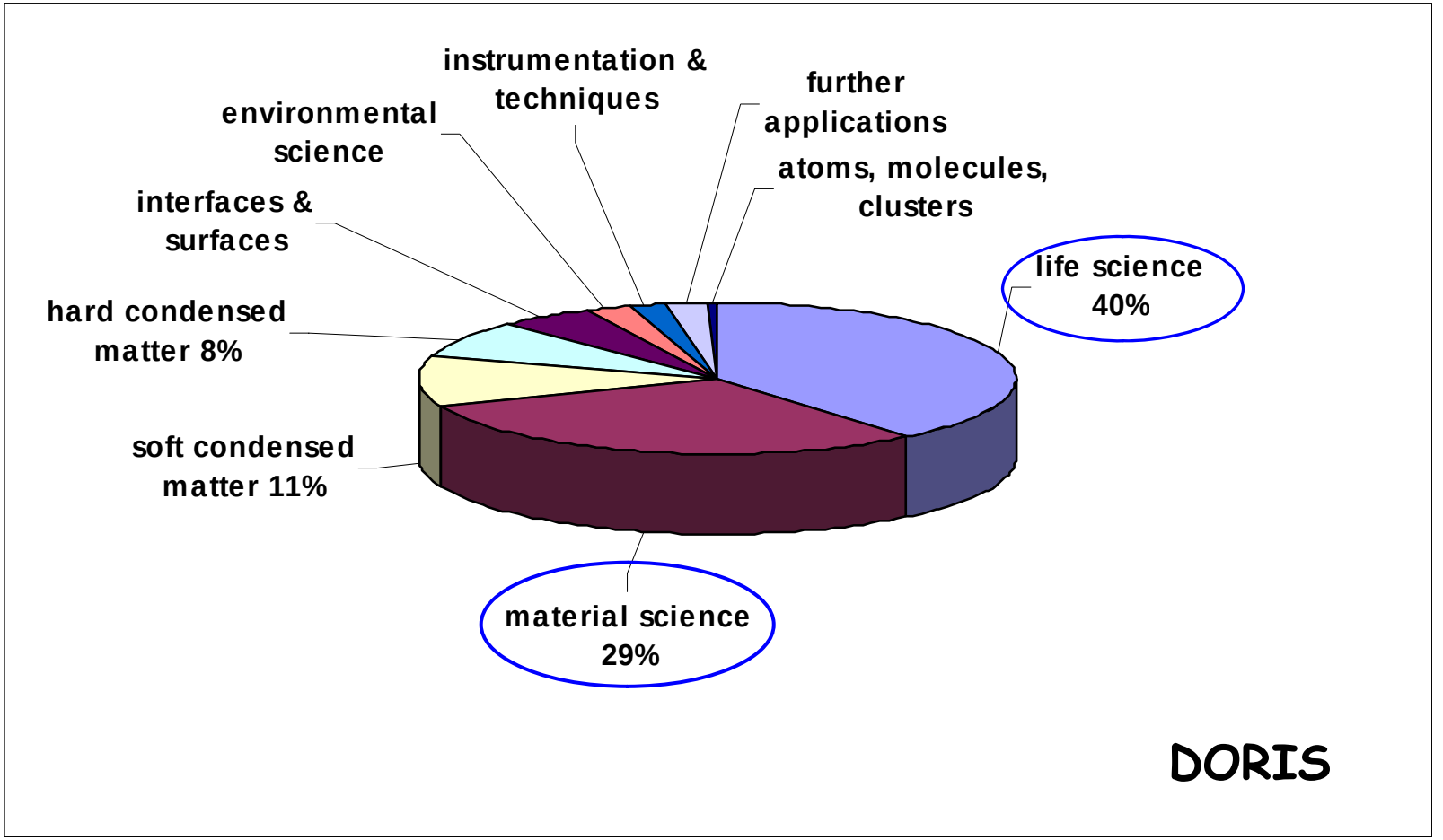


Structural biology:
Outstations of
EMBL
MPG

Materials science:
Outstations of
GKSS
GFZ

HELMHOLTZ GEMEINSCHAFT

Distribution among Research Fields (biology included)



distribution corresponds roughly to "number of experiments performed", it does not scale to allocated beam time

PETRA III

Dezember 2007:

- Concrete base plate of PETRA III-Hall
  - „Longest monolithic plate in the world": 280 m long, 24 m wide, 1 m thick
  - 850 concrete mixer trucks for 6600 m3 concrete needed

Beginning April 2008:

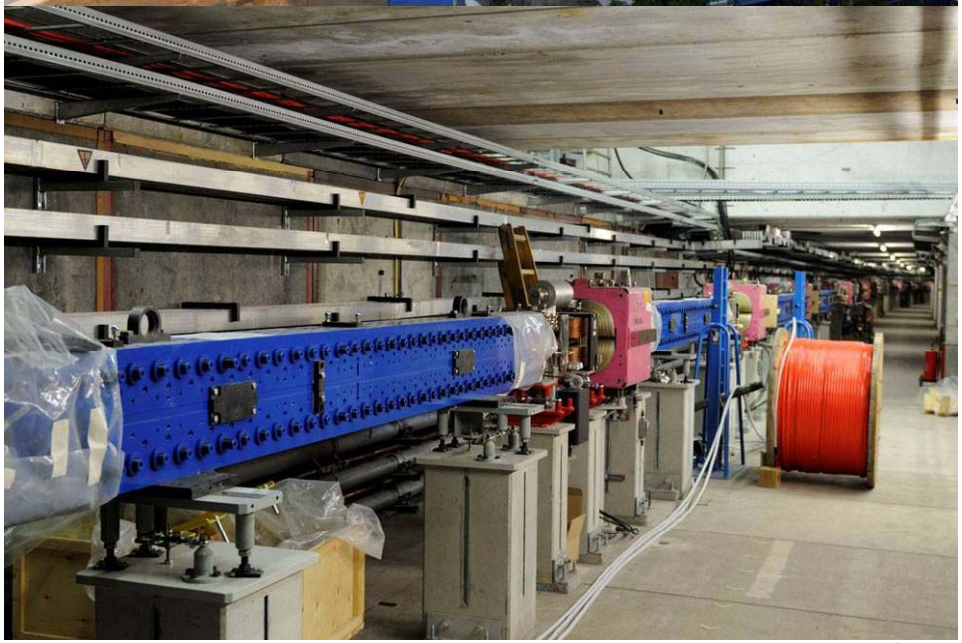
- Surface finish completed, hall was handed over to DESY

PETRA III

June 2008:

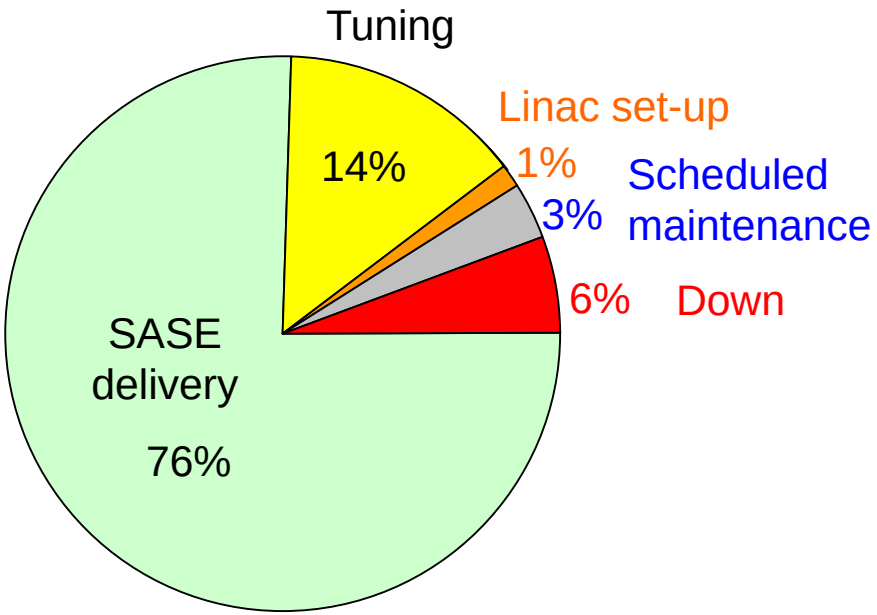
- PETRA III-Hall
  - Outside finished
  - Installation of hall has started

- Refurbishment of PETRA ring finished



FLASH User Runs

FEL user experiments Nov/Dec 2007+ Feb/Mar 2008 + Apr 2008:
25 days + 30 days+ 28 days = 83 days (54 % of time)



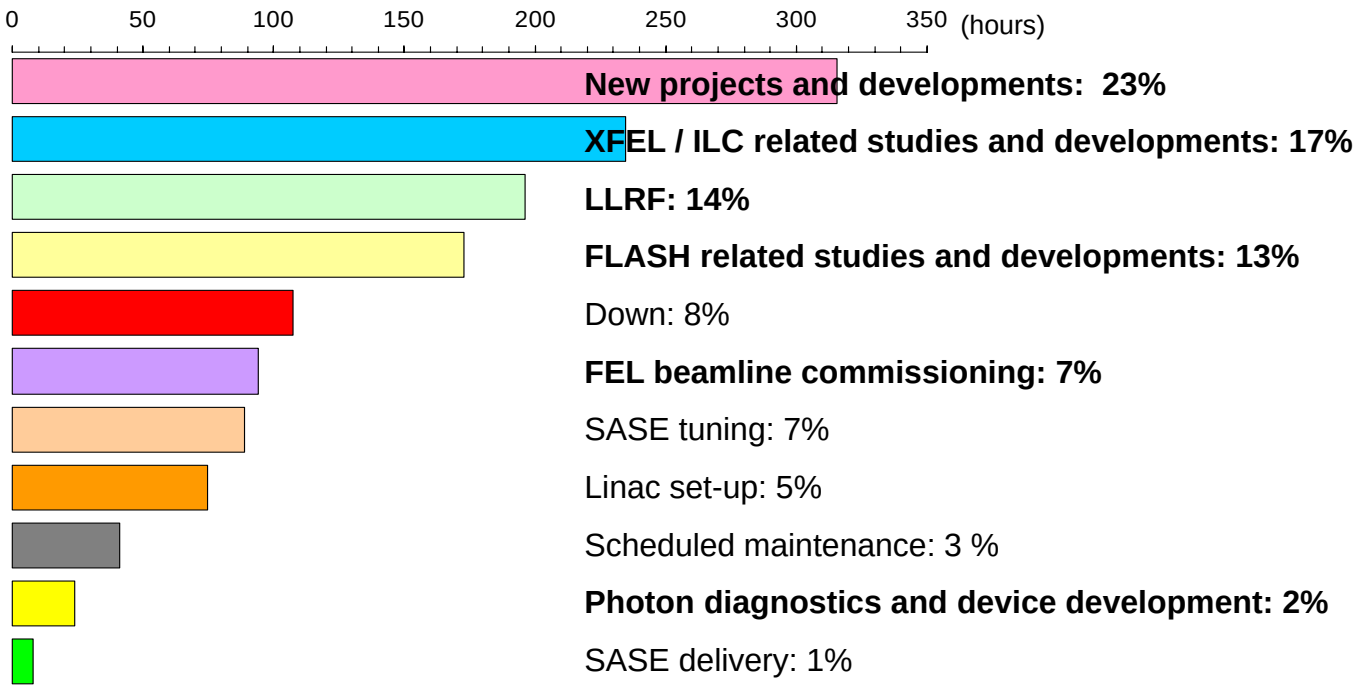
(%)

Block	1	2	3
SASE	71	80	75
Tuning	14	13	16
Set-up	2	1	0
Mainte-nance	5	4	2
Down	9	3	6

Tuning:
In 12 weeks wavelength changed 47 times
19 different wavelengths

Accelerator and FEL Studies

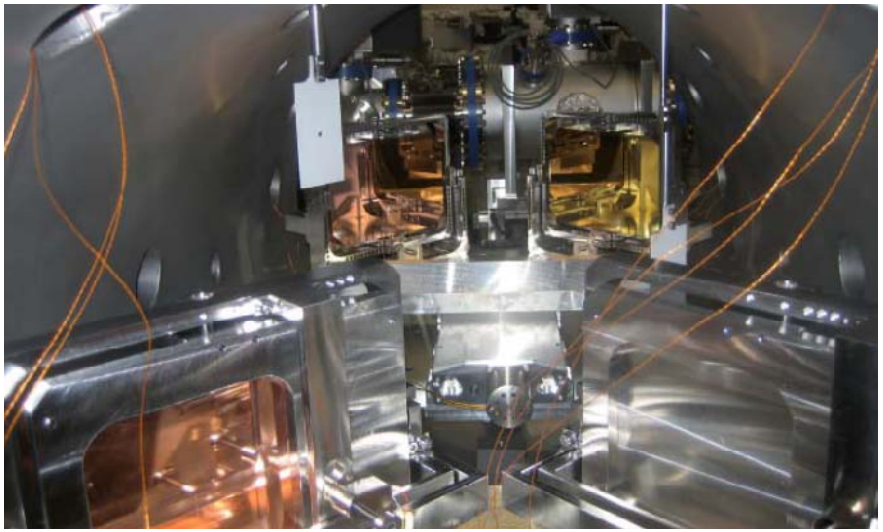
- 2 blocks: Jan/Feb 2008 (35 days) and March 2008 (19 days)
  (35% of time)



New Projects and Development

April 2008

- Successful commissioning of the new Far Infra-Red (FIR) beam line at FLASH



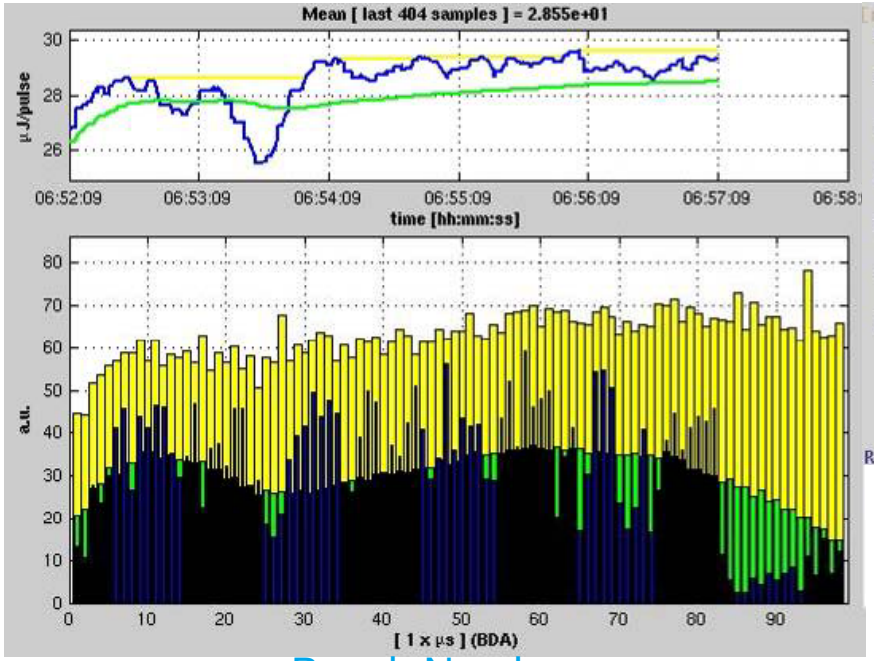
For superposition with EUV pulses from FLASH in the probe chamber

FIR-synchronization with FLASH-Pulses to a ~ 40 fs

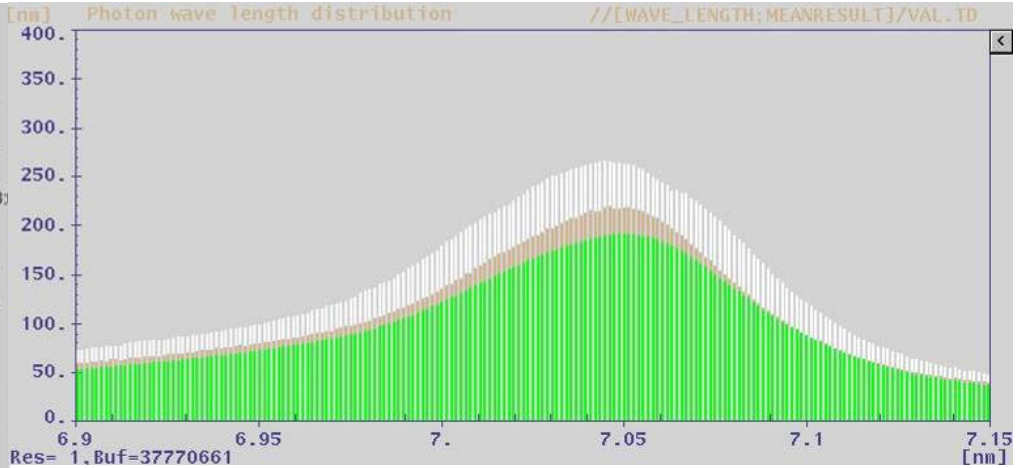
„Pump-Probe" experiments

Long Bunch Train Run at 7 nm

- 5 days continuous running with 100 bunches 500 kHz for two experiments
- Wavelength: 7.05 ± 0.1 nm
- Average SASE level ~30 µJ (14 mW average power)



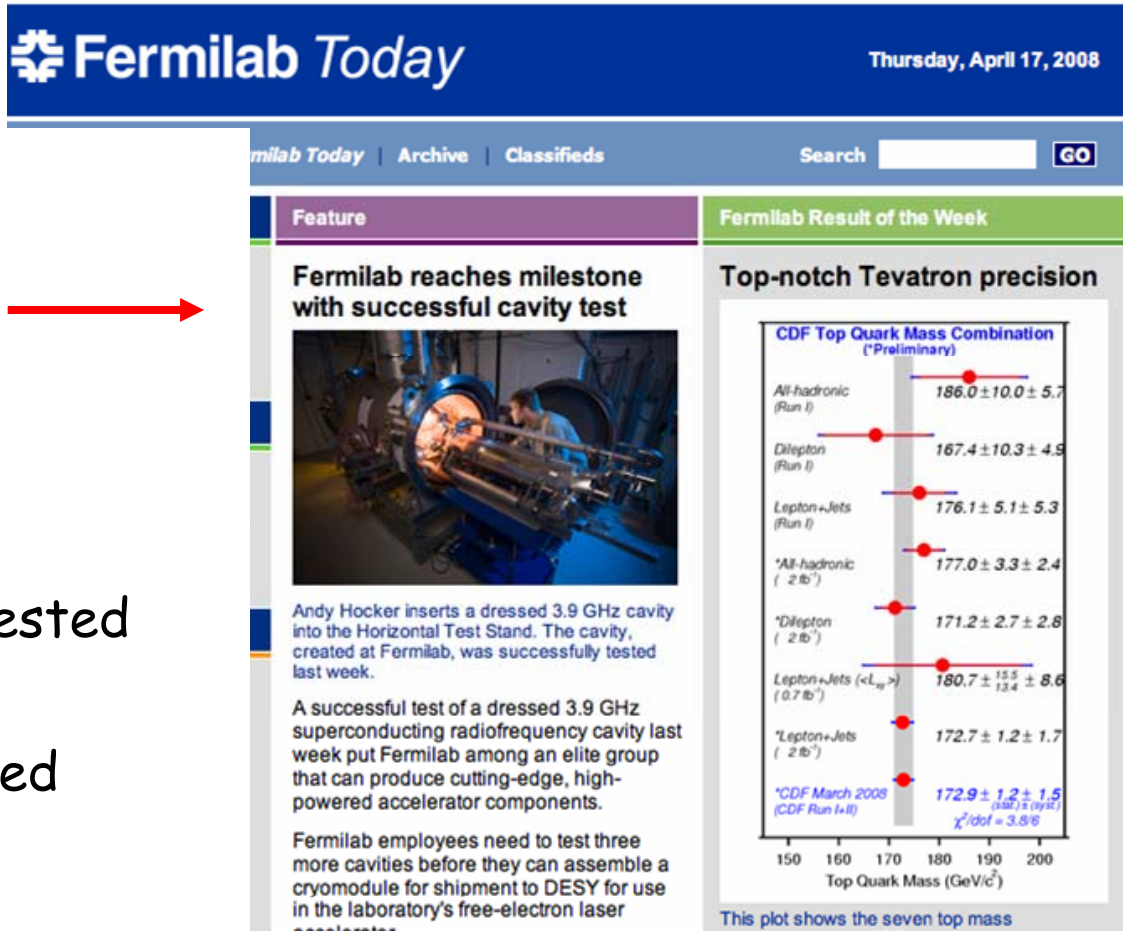
Bunch Number



Wavelength (nm)

FLASH Upgrades

- 3rd harmonic 3.9 GHz cavity
  - 1st dressed cavity tested successfully at Fermilab
  - 24 MV/m @ 1.8 K
- sFLASH : tunnel drilling
- 7th module
  - Module 8: waiting to be tested
- Energy monitors BCs
  - monitors are being installed
- Arrival time monitor
- Synchronization system
- New Master RF
  - System is installed



Fermilab Today

Thursday, April 17, 2008

milab Today | Archive | Classifieds Search GO

Feature

Fermilab reaches milestone with successful cavity test

Andy Hocker inserts a dressed 3.9 GHz cavity into the Horizontal Test Stand. The cavity, created at Fermilab, was successfully tested last week.

A successful test of a dressed 3.9 GHz superconducting radiofrequency cavity last week put Fermilab among an elite group that can produce cutting-edge, high-powered accelerator components.

Fermilab employees need to test three more cavities before they can assemble a cryomodule for shipment to DESY for use in the laboratory's free-electron laser

Fermilab Result of the Week

Top-notch Tevatron precision

CDF Top Quark Mass Combination (*Preliminary)

All-hadronic (Run I) 186.0 ± 10.0 ± 5.7

Dilepton (Run I) 167.4 ± 10.3 ± 4.9

Lepton+Jets (Run I) 176.1 ± 5.1 ± 5.3

*All-hadronic (2 fb⁻¹) 177.0 ± 3.3 ± 2.4

*Dilepton (2 fb⁻¹) 171.2 ± 2.7 ± 2.8

Lepton+Jets (<L_{int}>) (0.7 fb⁻¹) 180.7 ± 15.5/13.4 ± 8.6

*Lepton+Jets (2 fb⁻¹) 172.7 ± 1.2 ± 1.7

*CDF March 2008 (CDF Run I+II) 172.9 ± 1.2 ± 1.5 (χ^2/dof = 3.8/6)

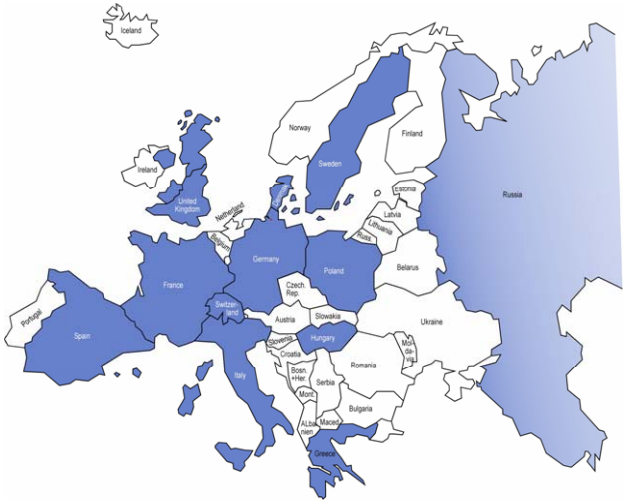
150 160 170 180 190 200

Top Quark Mass (GeV/c^2)

This plot shows the seven top mass

Status of the European XFEL Project

- 14 countries have signed Memorandum of Understanding for the preparatory phase
- Construction Phase officially launched on 5 June 2007



- Prep. Phase support by European Funds
- 12 countries ready to sign convention
- Funding of phase 1 assured

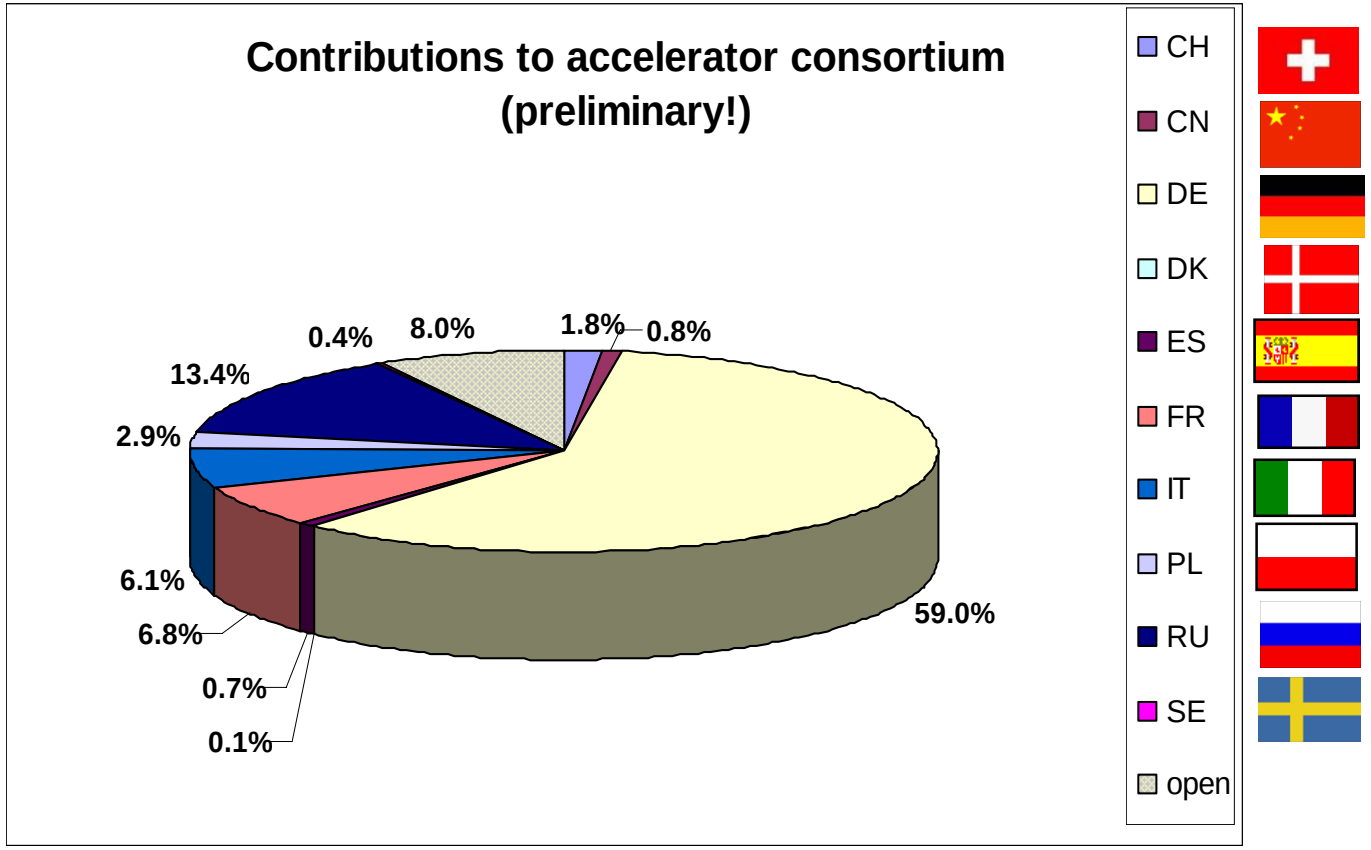
Civil construction tenders out

First Beam: 2013
Complete Operation with up to 10 Exp. Stations: 2015

CH CN DE DK ES FR GB GR HU IT PL RU SE SK

Accelerator in-kind contributions *(total value 517 M€)*

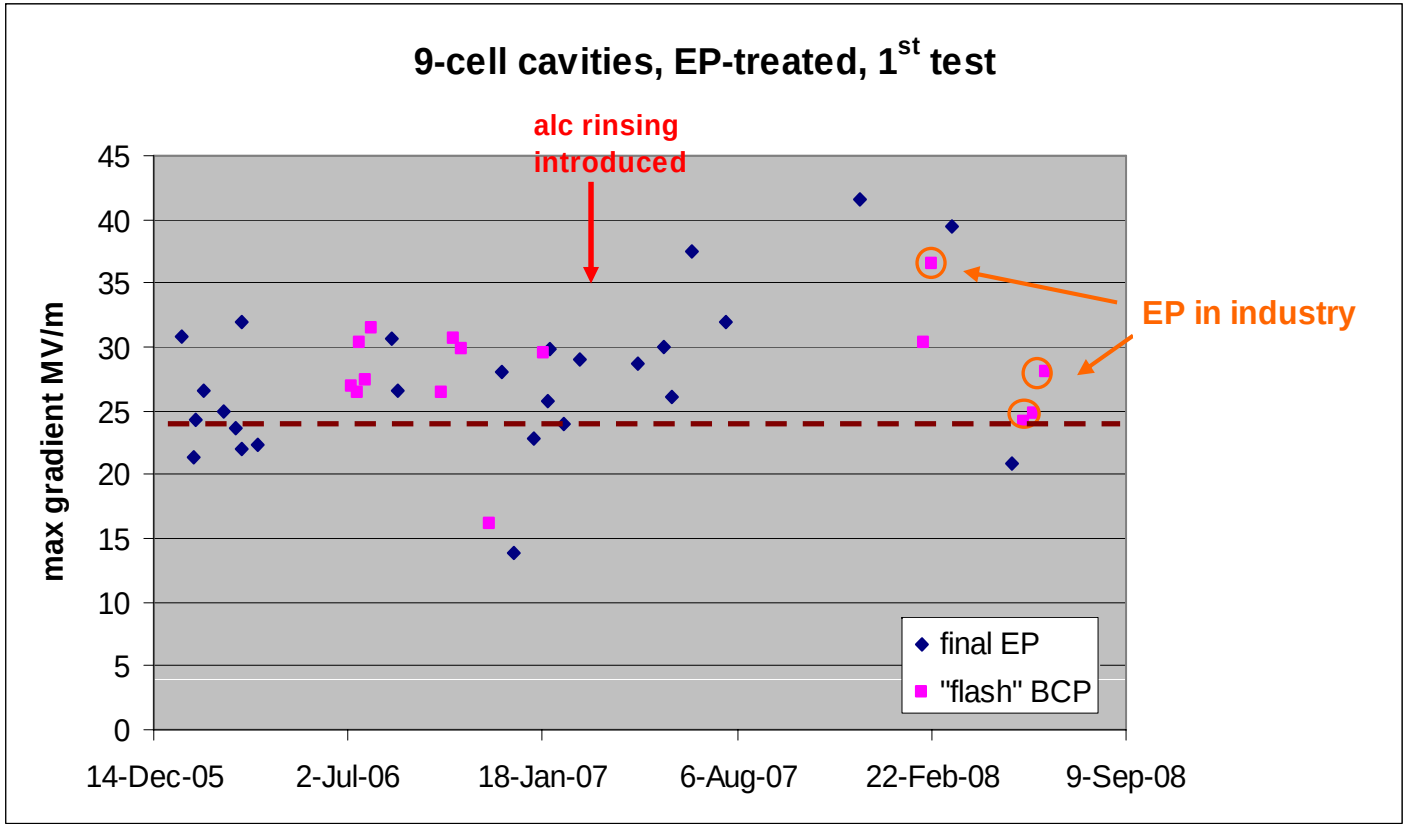
Figures will change in detail – negotiations ongoing!



Many institutes from TESLA collaboration & new partners

News from the Cavities

- Major progress in industrial cavity preparation:



Mock-up Tunnel

- Installation of all components tested in mock-up tunnel:

Particle/Astroparticle Physics

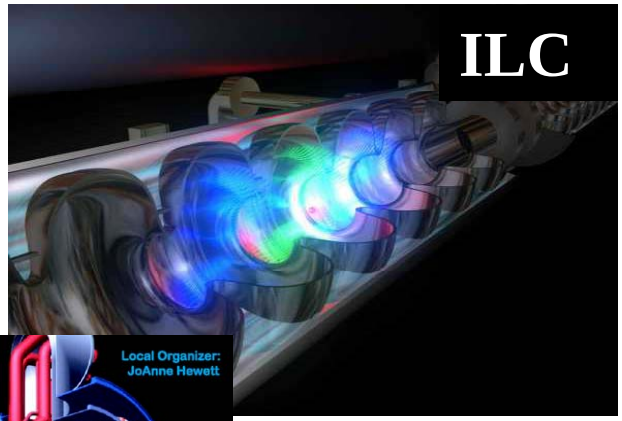
Strategy:	remain a leading and attractive particle physics lab key: Helmholtz-Alliance

HERA	complete physics analyses and combined results, HERA -> LHC,
LHC	involvement in ATLAS and CMS, commissioning and physics, detector R&D towards possible upgrade Analysis centre at DESY
Linear Collider	central role in all aspects and through all phases
Theory	keep balanced excellence in phenomenology, string theory, cosmology and astroparticle physics, lattice gauge theory (incl. hardware)

IceCube	complete installation, R&D on acoustic detectors, leading analysis contributions (-> multimessenger), prepare for the future

DESY after HERA – Participation in LHC

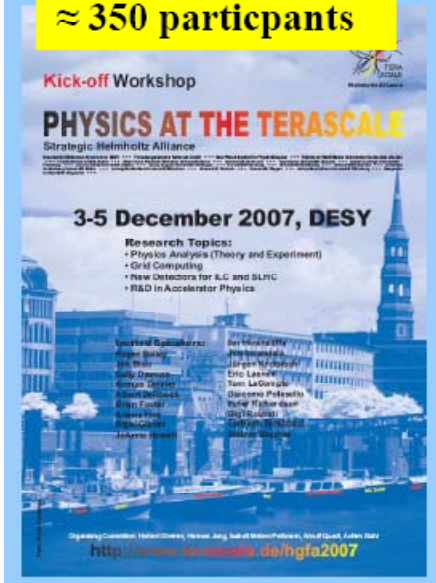
- scientific breakthroughs
- strong connection to HERA science
- preparation for ILC



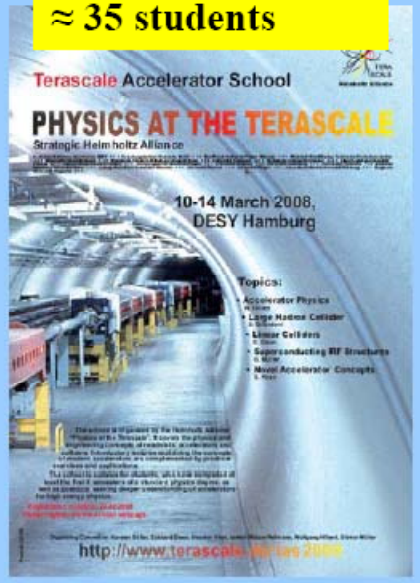
Physics at the Terascale

- Start July 2007 for 5 years duration
  - all structures set up and most positions filled
  - Analysis Centre and Virtual Theory Institute constituted
  - NAF prototype operational
  - lecture and school programme in full swing, e.g.:

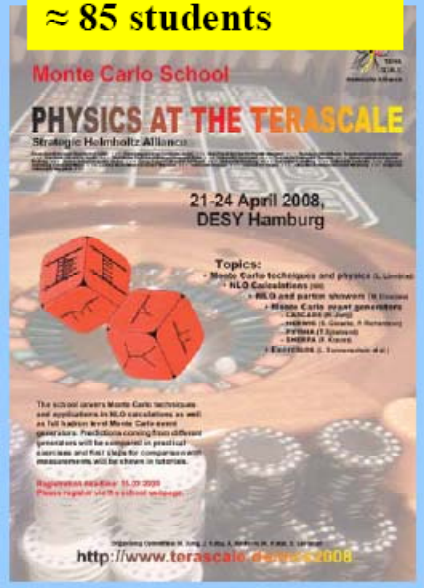
Kick-off workshop
≈ 350 particpants



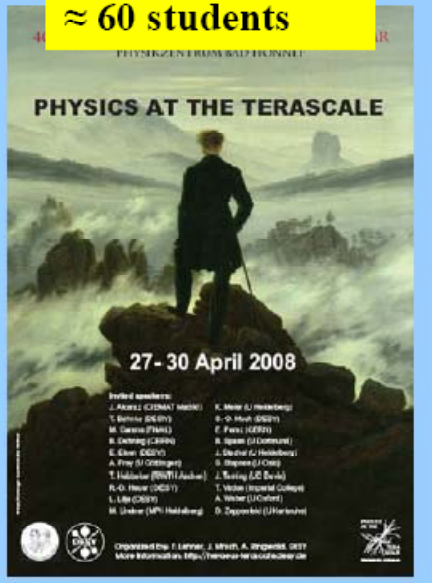
Accelerator school
≈ 35 students



Monte Carlo school
≈ 85 students



Heraeus seminar
≈ 60 students



+ university lectures on accelerator physics
+ teaching buy out

- Planned:
  - Sep 2008 Statistical Methods
  - Nov 2008 Parton Density
  - Dec 2009 Annual Workshop (Aachen)

DESY at the LHC

- CMS:
  - Management involvement: 2 Scientists
  - Coordination tasks: 3 Scientists
  - The group continues to grow
- ATLAS:
  - ALFA (absolute Lumi measurement), MC generator support.
  - Young investigator group joined.
  - The group continues to grow

About 50 persons (Staff + PostDocs) work on LHC, mostly part time also on HERA, plus 14 PhD students

- HERA experts play a key role in the commissioning

ALPS

Elementary particle physics at very low energies :

- Search for particles which are 1.000.000 times lighter than electrons. Hints from:
  - Masses of neutrinos,
  - Dark energy

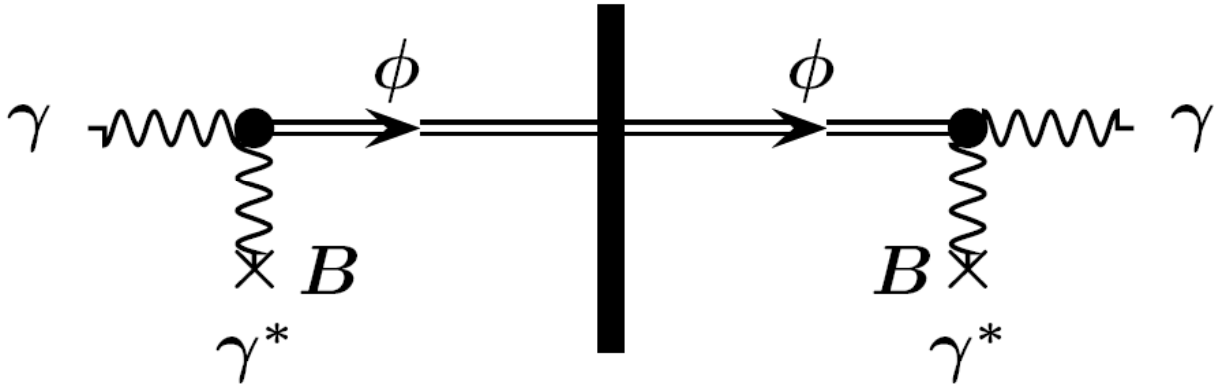
- New very light particles can be easily integrated in extensions of the SM

- Experimental searches for light particles would
  - test String-Theories,
  - Provide indirect access to extremely high energies
  - Complement experiments at LHC and ILC.

The ALPS-Experiment at DESY

DESY, Hamburger Sternwarte, Laser Zentrum Hannover,
MPI für Gravitationsphysik (Albert Einstein Institut)

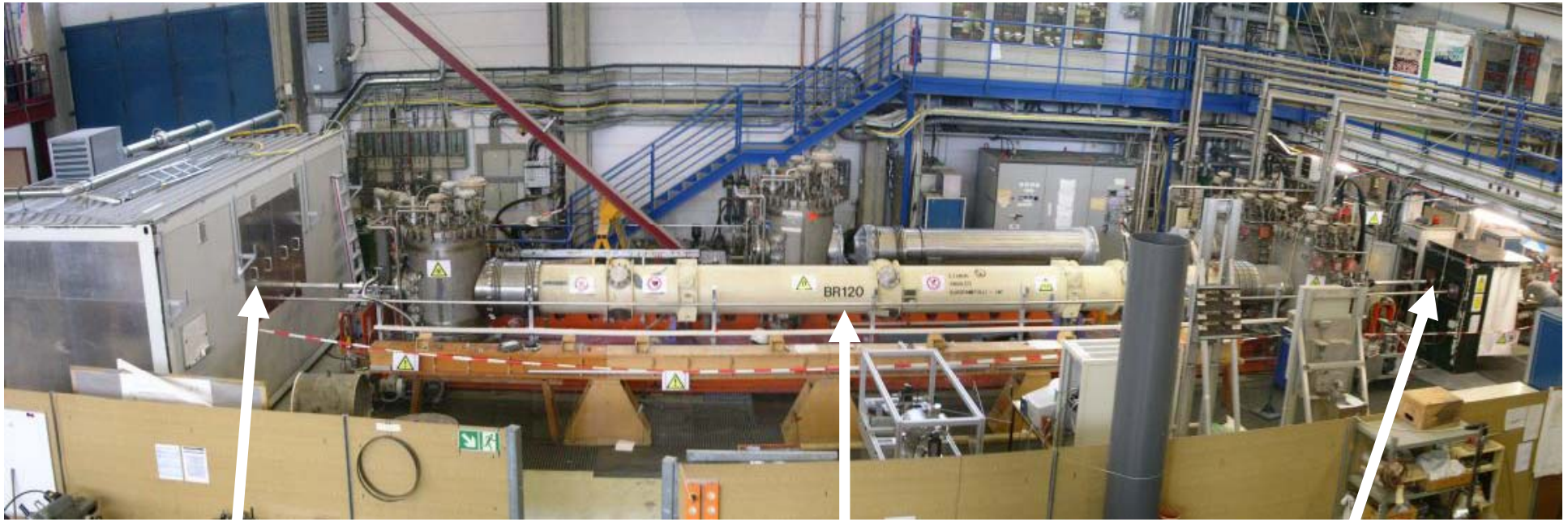
search for „Light through the wall".

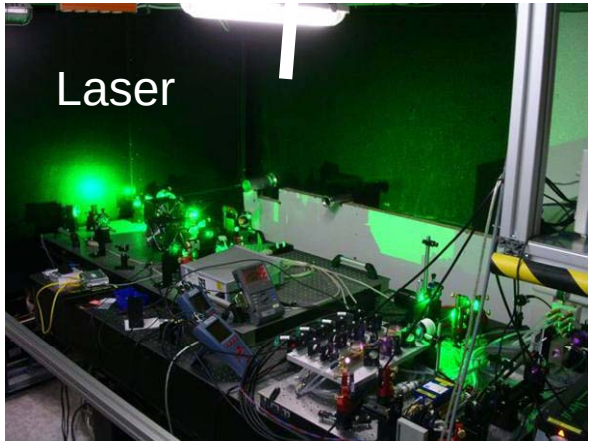


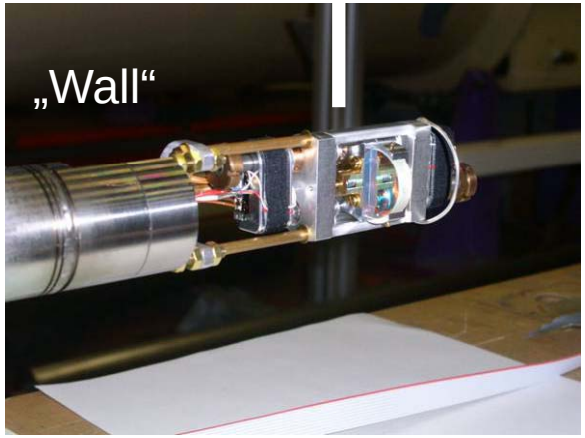
Skivie 1983, Ansel'm 1985, Van Bibber et al. 1987

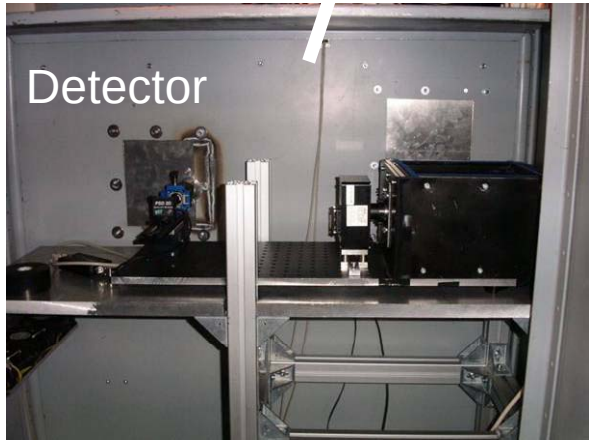
The ALPS-Experiment

Measurement using old HERA-Dipole magnet









New EU Projects

EU FP7 Approvals

Preparatory phases of Construction of New Infrastructures

ILC-HiGrad (DESY coordinating) and preparatory phase

sLHC preparatory phase

Pre-XFEL (through European Project Team)

EUCARD IA (SC cavity work and other topics)

- "This I3 selectively addresses some of the most critical S&T topics for advanced accelerators, thus laying the groundwork for decisions to be made on future European and Global accelerators in the next 5 years. The concept is sound and the quality of the objectives is world leading. The activities in the framework of this proposal are a useful, more technical complement to FAIR-PP, SLHC-PP, ILCPP, Hi-GRAD and EuroNu-DS. The proposal brings together all the leading European laboratories, and will reinforce and expand existing collaborations.

HiGrade

- Main goals
  - Demonstration of high gardients in SC cavities (ILC-specifications)
    - in close connection with XFEL
    - Build-up of common test facilities
    - Common control systems for tests
  - ILC-Siting
    - Measures for exploration of possible sites in Europe (e.g. Dubna, Russia)
  - ILC-Governance
    - Exploring possible models

- DESY-Partners: INFN, CEA, CNRS/IN2P3, CERN, Oxford

Helmholtz Evaluation: DESY 2010-2014

The present period of program oriented funding within the Helmholtz Association ends in 2009

In 2008 the research area 'Structure of Matter' will prepare the programs for the period 2010-2014, which will be evaluated in 2009.

The Helmholtz Senate has approved the research policy guidelines and the key points of the programs as seen by the participating centers. ->

DESY will participate again in three programs: EPP, AP, Photons (PNI)

The ESC has set up two groups to evaluate the content of the proposed programs (13/14. Oct)

Then finalised programs -> VR

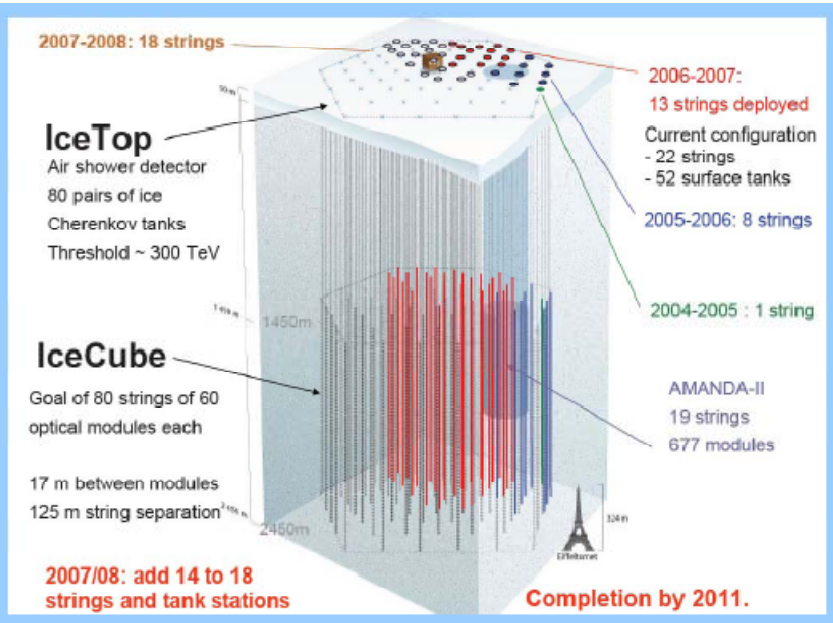
Particle Physics Program 2010-2014 (Helmholtz)

- Strong participation in 2 LHC experiments (ATLAS and CMS). Completion of precision analysis of HERA data
- Expansion of Tier2 centres and analysis centre at DESY.
- Theory in close connection with experiments, particle/astroparticle theory. string theory, lattice gauge theory (Zeuthen)
- Continued development of high gradient SCRF cavities for ILC, exploiting the synergy with the XFEL
- Detector development for sLHC and ILC, contributing to XFEL detectors
- Helmholtz-Alliance ‚Physics at Terascale'.

  The program is based on the ‚European Strategy for Particle Physics', which itself is part of the ESFRI Road Map.

Astroteilchenphysik

- Present and future activities
  - IceCube in full swing
  - 50% of detector installed & operational
- DESY hardware activity
  DOM production mostly completed
- Test of acoustic neutrino detectors at IceCube



50 Years of DESY

50 Years DESY on 18.12.2009

We plan a number of events, which will start in spring 2009 and end in early 2010.

Minister Balke Max Brauer

Summary

Particle- and Astropart.-physics	Accelerators Develop./Operation	Research with Photons

The scientific focus of the research at DESY is the understanding of the structure of matter at different length and time scales

In its three areas of key competence DESY is a world leading institution

Science driven technology developments have led to a major new research possibilities for photon science and particle physics, such as FLASH, XFEL and ILC